

Device for Seizing of Flat Material on a Transporting Surface

Field of the Invention

The present invention is related to a device for seizing of flat material on a transporting surface such as signatures on a outer surface of a paper conducting cylinder such as a folding cylinder of a folding apparatus.

Background of the Invention

EP 0 220 644 A2 discloses a vacuum system for combination fold off control. A signature folder is disclosed in which a vacuum system is provided to prevent tail whipping of the signature when the direction of movement thereof is reversed. The folder provides two counter-rotating cylinders. A portion of the signature moves along the periphery of one cylinder and than reverses direction to move on to the periphery to the other cylinder. A vacuum system is provided adjacent to the signature when it reverses direction. The vacuum system includes a pair of guides and a central, freely rotatable vacuum roll. The vacuum causes the reversing portion of the signature to move into engagement with the guide and rolls and eliminates tail whipping. Further, it guides the signature so that it smoothly moves on to the periphery of the subsequent roll. The major drawback of said vacuum solution according to EP 0 220 644 A2 resides in the fact that by a vacuum source only the outermost layer of a respective leading edge of a web of material can be securely seized on a respective cylinder surface. A web of material including a plurality of different ribbons or different layers is not secured against opening-up during the transitory period after a respective signature has been severed from a web of material and a new leading edge has been created.

A recently published application which is not necessarily prior art to the present application, EP 0 931 748 A1, discloses a pinless folder apparatus assigned to a rotary printing press. This solution comprises a first paper-conducting cylinder the surface of which supports a web of material to be processed in the pinless folder apparatus. Said first paper-conducting cylinder cooperates with a cutting cylinder assigned thereto having a number of knife assemblies assigned to its respective outer circumference. According to this solution of the state of the art cyclically

actuable product holding means are provided either on the circumference of that first paper-conducting cylinder or on the respective circumference of the said cutting cylinder. Said product holding means are actuated so as to engage a respective leading edge supported on said first cylinder surface in counterclockwise direction, to seize a newly created leading edge after a signature has been severed from the respective lead edge of the web of material.

With this solution said respective holding elements have to be activated by a respective cam element which has to be arranged on a respective cylinder's end surface. A cam/cam follower assembly is quite space consuming and subject to maintenance and premature wear. The respective surface of the cam has to be hardened to be wear-resistant which renders the actuating component of the respective holding element more difficult to manufacture.

Summary of the Invention

In view of the solution according to the state of the art it is accordingly an object of the present invention to provide for a product-seizing element actuable by cooperation with a paper transporting surface supporting the respective flat material to be seized.

A further object of the present invention is to eliminate cam activation of product-seizing elements.

Still further, an object of the present invention is to provide for reliable positioning of a respective leading edge of a web of material upon a cutting operation when severing a signature from a multi-layered web of material.

According to the present invention a device for seizing a flat material on a supporting surface includes:

- a first cylinder having knife assemblies assigned to its circumference,
- a paper conducting cylinder supporting a flat material on its outer circumference and
- biased product seizing elements assigned to said circumference of said first cylinder adopting upon cooperation with said flat material received on said outer circumference an engaging position.

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Advantages of the present invention are the automatic actuation of pretensioned product seizing elements by contact of said product seizing elements with a respective opposite arranged transporting surface without activation of particular elements such as a cam or a cam follower. Said product seizing elements are advantageously mounted integrated within a respective surface of a cylinder either adopting a disengaged extending position due to the biasing force or a position in which they engage in a respective leading edge automatically exerting a force upon said leading edge due to the respective subjecting with a pretensioning element.

10 *g* In further advantageous embodiments according to the present invention said product seizing elements by punctual contact only exert a seizing force upon said respecting flat material which results in a non-marking of the respecting leading edge by said product seizing elements and consequently in an non opening-up of said multi-layered web of material when including a plurality of ribbons. Said product seizing elements either may extend spaced apart from one another over the entire width of said web of material or the respective paper-conducting cylinder or maybe arranged in the middle or the respective lateral edge portion of said cylinder.

15 Said product seizing elements either can be biased by having a pretensioning element assigned to corresponding housings of said product seizing elements or having said product seizing elements subjected to a pressure source such as the pneumatic or hydraulic system.

20 In a very advantageous embodiment according to the present invention said product seizing elements are received movably within a knife box which easily is exchangeably arranged on a respective circumference of a first cylinder, such as respective cutting cylinder. To allow for an engagement of the very first part of the newly created leading edge of a multi-layered web of material said product seizing elements are arranged within a knife box in an inclined orientation. During the respective engaging movement of leading edge said heads of said product seizing elements contact said leading edge close to the cross-cut, severing a respective signature from a web of material thus creating a new product leading edge. By the close orientation of the respective product seizing element to the cross-cut a reliable registration of the respective new created product seizing element is guaranteed

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maintaining register of said leading edge upon the supporting surface allowing for a clear sharp cross-cutting operation between said two cylinders. Said accurate registration of the newly created product seizing element on the respective transporting surface of the transfer cylinder results in a high accuracy of the following cross-folding operations to be executed within a folder apparatus such as a pinless folding apparatus.

Said product seizing elements may include a rounded head portion and a pad or a layer to provide for a smooth contact surface for said leading edge to prevent marking on the respective product leading edge received and supported on said paper conducting cylinder.

A respective product seizing device advantageously can be used on cooperating cylinders such as folding-/ or paper-conducting cylinders of a folder apparatus, assigned to a web fed rotary printing press for commercial and newspaper applications.

According to a method of operation of a product seizing element on a surface of a cylinder in a folding apparatus said leading edge of a flat material is supported on a transporting surface, whereas said product seizing elements adopt a first disengaged position, prior to the engagement of the leading edge. In a first stage of cooperation said cylinder surfaces do not cooperate with each other but rather move according to the rotational speed gradually towards each other in circumferential direction. Upon contacting of the product seizing elements with respective lead edge portions of the web of material received on the transporting surface of said transfer cylinder a seizing force is exerted upon the outer surface of the leading edge to prevent the leading edge of the web of material received from opening-up. The respective leading edge is not released until it has been captured by a gripper extending out of the respective surface of said paper conducting cylinder such as a transfer cylinder. Upon further rotation of said cylinder having said product seizing elements assigned thereto said seizing elements adopt a second disengaged position. Said product seizing element move out of the cylinder surface again since they are subject to a biasing force, whereas that newly created leading edge of the web of material is securely gripped by said gripper element.

Brief Description of the Drawings

The novel features which are considered as characteristic for the invention are set forth in particular in the attended claims. The invention itself however both as to its construction and its method of operation together with additional objects and advantages thereof will be best understood from the following description of a specific embodiment when read in connection with the accompanying drawings in which:

Fig. 1 is a schematically given side elevation of a respective folder assembly having two cooperating cylinders and

Fig. 2 is a detailed view of the cutting area of the cross-cutting area given in three different stages of the cylinders' rotation.

Description of Preferred Embodiments

Fig. 1 shows a schematically given side elevation of a respective folder assembly having two cooperating cylinder surfaces.

According to the embodiment of the folder assembly given in Fig. 1, a web of material 1 may pass a former board 2 arranged prior to a first and second pair of nip rollers 5, 6, respectively. Upon passage of said former board 2 a single web of material 1 or a multi-layered web of material 1 including a plurality of ribbons may receives a first longitudinal fold. Said former board 2 is not necessarily provided; the web of material 1 may pass said nip 5, 6 respectively on the subsequent web travel pass without being longitudinally folded.

As forwarded past said first pair of nip rollers 5 and said second pair of nip rollers 6 said web of material 1 enters a cutting area 13 between two cooperating cylinders 7, 14 respectively. Said first cylinder 7 may be a cutting cylinder 7, the outer surface of which provided with a curvature according to the respective radius 8. On the respective outer surface 9 of said cutting cylinder 7 at least one knife assembly 12 may be arranged which may be received in a respective knife box 10. The different radii 8 shown in the embodiment according to Fig. 1 show different stages of rotation of said first cylinder 7, a cutting cylinder. Corresponding to the

different stages of rotation of said first cylinder 7 the different stages of rotation of a adjacently arranged transfer cylinder 14 are shown. To the respective cylinder's outer cylinder surface 15 of the transfer or a paper-conducting cylinder 14 such as a transfer cylinder, anvil bars 16 are assigned which are received in grooves. Still further to the outer surface 15 of the respective product paper-conducting cylinder 14 a gripper means 17 is assigned. Both said anvil bars 16 and said gripper means 17 are given in three different rotational stages which will be described in further details according to Fig. 2. By cooperation of the respective knife assemblies 12 with said cutting counterpart 16 arranged on the opposite surface 15 of said paper-conducting cylinder signatures are severed from the respective incoming material. The accuracy of further folding operations to be processed upon further passage of signatures through the folder assembly significantly depends upon the accuracy with which said cross-cutting operation is performed and with which accuracy the respective leading edge is supported on the respective surface 15 of the paper-conducting cylinder 14. Any misregistration occurring here will jeopardize the folding quality in subsequently following folding operations.

Fig. 2 is a detailed view of the cutting area given in three different stages of rotation identified by reference numerals 18, 19 and 20 respectively.

Said first cylinder 7 such as a cutting cylinder rotates about its respective axis 23 from which the respective outer surface 9 extends by a radius 8. In the respective outer surface 9 of said cutting cylinder 7 knife assemblies 12 are received. Said knife assemblies 12 are received in grooves with respective knife boxes 10. Said knife boxes are arranged within said cutting cylinder by fastening means not shown in greater detail here to allow for a quick exchange for the respective knife boxes upon wear of the respective cutting tips 26 of said knives 12. In an inclined position 31 within said knife boxes 10 respective product seizing elements 27 are arranged. Said product seizing elements 27 include an engaging board element 27 having a rounded portion 29. Said rounded portion 29 may include a coating to prevent marking of the respective leading edge when contacted by said head 29 of said engaging bolt 27. Within the respecting housing of said engaging bolt a biasing element such as a pretensioning spring is provided to keep the engaging bolt 27 in its extended position which will be described below.

It is conceivable as well as to to have said housing of said engaging bolt connected to a pressure source such as a pneumatic or hydraulic system.

The respective cooperating cylinder such as a paper-conducting cylinder or a transfer cylinder 14 receives assigned to its respective outer circumference a plurality of counterparts 16 to perform the cross-cut operation. Said anvil bars are received in grooves 22 extending over the width of the respective paper-conducting cylinder 14. Furthermore, said paper-conducting cylinder 14 is equipped with product grippers 17 given only schematically here. Said product gripper 17 comprise a hook-shaped seizing area and are given here in an extended gripper position 36 and a respective retracted group of position 37. The cooperation of said cutting cylinder 7 and said product-conducting cylinder 14 is as follows:

A web of material 1, 24 including a single ribbon or a plurality of ribbons either longitudinally folded or not enters said cutting area 13 between the cooperating surfaces 9 and 15 of said cylinders. In a first stage of rotation identified by reference numerals 18, 33, respectively, said engaging bolt 27 is given in its extended position. In the extended position said engaging board is moved out of surface 9 of the respective cutting cylinder 7 due to its pretensioning force exerted by a spring element to give an example. In this stage of rotation the web of material 1, 24 is supported by the outer circumference 15 of the respective paper-conducting cylinder. In this stage of rotation the corresponding knife 12 has not contacted the respective leading edge 25 of the web of material 1, 24 and said gripper 17 arranged in the periphery of the surface 15 of the respective paper-conducting cylinder is shown in its retracted position identified by reference numeral 37.

Upon further rotation of the respective outer surface 9, 15, respectively in the respective senses of rotation, the head 29 of the respective engaging bolt 27 surrounded by its guide 34, gradually seizes the respective leading edge 25 of the web of material 1, 14 from which then by cooperation of said knife 12 with said anvil bar 16 a signature is severed. During the engagement of said engaging board 27 with the respective web of material 1, 27 in the front area thereof a reliable cutting operation is guaranteed and an accurate positioning of said newly created

7

leading edge 25 of the respective multi-layered web of material is maintained. Due to the force exerted upon the engaging board by the respective biasing or pretensioning element the outer surface of the leading edge of the web of material is prevented from opening-up during passage of the cutting zone 13. In this stage of rotation of the respective cylinders identified by reference numerals 19 and 32 the respective gripper element 17 is still shown in its retracted position identified by reference numeral 37. The force exerted by the pretensioning or biasing element upon said engaging bolt 27 is dependent on the thickness of the respective leading edge, on the respective thickness of the paper stock and of the number of ribbons of the web of material 1, 24 to be processed.

Finally, a third stage of rotation is identified by reference numerals 20, 33.

Upon further rotation of cutting cylinder 7 and the paper conducting cylinder 14 said engaging bolt 27 gradually extends out of the respective guide 34 due to the biasing or pretensioning force exerted thereon by a biasing element such as a spring, the previously mentioned pressure source such as a pneumatic or hydraulic system. Consequently, by further extension of said engaging bolt 27 out of its guide 34 the force with which said leading edge is urged against the outer surface 15 of the respective paper-conducting cylinder 14 gradually decreases. However, by the force still exerted upon the leading edge 25, the leading edge 25 is kept in its position above said anvil bar 16. As can be derived from the third stage of rotation 20 given in Fig. 2, the gripper now gradually moves into an extended gripper position 36 to seize the respective leading edge 25 which will be released by said engaging bolt's 27 head portion 29 by further rotation of said cutting cylinder 7 about its excess of rotation 23. In the respective third stage of rotation 20 said engaging bolt 27 adopts a disengaged position identified by reference numeral 33. Upon further rotation of said paper conducting cylinder 14 in its respective sense of rotation and the cutting cylinder 7 according to its sense of rotation said product seizing element 27 – shaped as an engaging bolt for example – will keep its disengaged position 33, respectively, and upon a completion of a revolution will seize a respective new web of material when supported on the respective outer surface 15 of the paper-conducting cylinder.

The automatic actuatable product seizing elements according to the present invention can advantageously be used on pinless folder assemblies for use on web-fed rotary printing presses for commercial and newspaper purposes. The advantage according to the present invention is given by a smooth but reliable product handling so that no penetration holes, slots or whatever are formed on the respective signatures so that a further trimming or a further loss of paper during trimming operations can be avoided.

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Reference numeral list

- | | | |
|----|----|---------------------------|
| | 4 | web of material |
| | 5 | former board |
| 5 | 6 | former nose |
| | 7 | former rollers |
| | 8 | first pair of nips |
| | 9 | second pair of nips |
| | 10 | cutting cylinder |
| 10 | 11 | radius |
| | 12 | outer surface |
| | 13 | knife box |
| | 14 | product seizing element |
| | 15 | knife |
| 15 | 16 | cutting area |
| | 17 | paper conducting cylinder |
| | 18 | cylinder surface |
| | 19 | anvil bar |
| | 20 | gripper |
| 20 | 21 | first stage of rotation |
| | 22 | second stage of rotation |
| | 23 | third stage of rotation |
| | 24 | gripper head |
| | 25 | groove |
| 25 | 26 | excess of rotation |
| | 27 | web of material |
| | 28 | leading edge |
| | 29 | knife tip |
| | 30 | engaging bolt |
| 30 | 31 | center line |
| | 32 | rounded head |
| | 33 | biasing element |

- 34 inclined position
- 35 engaging position
- 36 disengaging position
- 37 guide
- 5 38 support
- 39 extended group of position
- 40 retracted group of position

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